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ABSTRACTS OF ARTICLES FROM "TRANSACTIONS OF THE INSTITUTE OF FERROUS METALLURGY, ACADEMY OF SCIENCES UKRAINIAN SSR"

/This report consists of abstracts of nine articles from Trudy Instituta Chernoy Metalurgii, Akademii Nauk Ukrainskoy SSR (Transactions of the Institute of Ferrous Metallurgy, Academy of Sciences Ukrainian SSR), Vol V, 1951./

1. "Concerning Direction of the Resultant of Forces With Which a Strip Reacts Against Rolls in the Ordinary Rolling Process," A. P. Chekmarev, Active Member, Academy of Sciences Ukrainian SSSR, N. P. Spiridonov, Candidate of Technical Sciences, pp 1-14, eight references.

The authors dispute the assumption of certain investigators that the resultant of all elementary forces of pressure and friction with which a strip acts on rolls in a steady process under conditions of ordinary rolling is directed vertically. They are in agreement with the other group of investigators who assume that the resultant force acts at a certain angle to the vertical on the side opposite the direction of rolling. This conclusion, the authors says, is a result of the established fact that there is a horizontal force in the rolling process, but the method, used by one of the followers of this trend, is cumbersome and one-sided.

The authors show the erroneousness of proofs presented in certain textbooks for substantiation of the assumption on the vertical direction of the resultant force, and discuss a simpler and more generalized method for establishing the incline direction of this force.

The formula for calculating a horizontal composite force was deduced by the author. They state that its application showed the insignificance of horizontal force in comparison with the vertical composite force

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2. "Tolerance Decrease in Rolling Operations as a Factor in Considerable Conservation of Metals," A. P. Chekmarev, pp 15-22.

This paper outlines possibilities for narrowing the tolerances for rolled stock by various measures, such as incorporation of regulators of rolling rhythm, improvement in calibration of finishing grooves, increase in wear resistance of rolls and use of rolls with cast grooves, more uniform heating of billets, improvement in technical condition of finish stands of rolling mills, etc.

The paper also discusses the problem of precise rolling and rolling by minimum tolerances on the basis of automatization of adjustment control for finish rolls, i.e., automatic regulation of the gap between rolls. The author was awarded a Stalin prize in 1941 for work in this field.

3. "Temper Brittleness of Constructional Steels," V. N. Svechnikov, Active Member, Academy of Sciences Ukrainian SSR, V. N. Gridnev, pp 23-53, 11 references.

Stating that the majority of existing theories of temper brittleness are not corroborated experimentally, the authors introduce a new point of view on the nature of this phenomenon, substantiating their theory by experiments with steel 35 khG2 of the following composition: 0.34% C, 0.56% Cr, 1.6% Mn, and 0.27% Si.

The authors state that mechanism and kinetics of temper brittleness, caused by various methods of heat treatment in the range of subcritical temperatures, may be explained satisfactorily if they are considered as a result of structural changes in the boundary zone of ferrite grains. This assumption, they add, is based on an experimentally established connection between structural changes in the grain boundaries and values of impact strength.

Experiments for determining the relationship between the impact strength and tempering conditions were conducted by the authors in three groups: (1) high-temperature tempering for various time periods at 660° followed by one-hour tempering at 500°; (2) tempering for various periods at 500° with preliminary 2-hour tempering at 660°; (3) tempering at 500° with preliminary high-temperature 30-hour tempering.

The authors assert that microscopic examination of steel specimens supports their viewpoint which attributes the cause of temper brittleness to decomposition of austenite of the boundary phase and to migration of decomposition products to the boundaries of ferrite grains.

4. "Rules of Molding for Steel Shape Castings," N. N. Dobrokhotov, Active Member, Academy of Sciences Ukrainian SSR, pp 54-57.

This paper gives general information on mold making practice, discussing such problems as number of flasks and cores, prevention of shifting of castings, geometrical position of castings in a mold, prevention of shrinkage porosity, elimination of hot and cold cracks, gating, pouring, etc.

5. "Effect of the Interdendritic Form of Graphite Segregation on the Wear Resistance of Cast Iron," N. A. Voronova, V. A. Suslov, and M. A. Puzanov, pp 58-67.

It is stated that a number of parts, such as piston rings or cylinder liners, subjected to wear in operation, represent thin-walled castings made by pouring highly overheated cast iron. This method of pouring, it is added, frequently leads to the formation of graphite in the shape of finely dispersed

flakes of interdendritic orientation. The article goes on to say that such a form of graphite segregation may occur in cast iron with both ferrite-perlitic and pure perlitic matrix, and that the ferrite-perlitic matrix is unfavorable for wear resistance in case of any form of graphite dispersion.

The present paper, the authors state, deals with the effect of interdendritic segregation of finely dispersed graphite on the wear resistance of cast iron with perlitic matrix favorable to wear resistance.

The article adds that tests of cast irons for wear established that the interdendritic form of graphite segregation has a very unfavorable effect on the wear resistance of cast iron under conditions of dry friction.

In case of friction with lubrication, this unfavorable effect is insignificant, it is stated, however, the paper adds, since ruptures of oil films are possible in operation, cast irons with the interdendritic segregation of finely dispersed graphite should not be used as an antifriction materials.

6. "Subzero Treatment of the Substitutes for High-Speed Steel EI 262 and EI 184," V. S. Polozhentsev, pp 68-96, 11 references

Using the method of specific volumes and the magnetometric method, the author studies conditions of austenite transformation in hardened steels on cooling to -30°, -60°, -80°, -110°, and -183°.

The author says that two grades of steel were used for experiments: EI 262 with 0.88% C, 4.54% Cr, 7.95% W, 2.07% V, 0.36% Si, 0.32% Mn, 0.03% S, and 0.02% P and EI 184 with 0.97% C, 7.46% Cr, 4.80% W, 1.93% V, 0.41% Si, 0.28% Mn, 0.02% S, and 0.03% P.

The author disputes the assertions of a number of investigators inside and outside the Soviet Union on the advantage of such temperatures of deep cold treatment as "from -40° to -80°," "-73°" or "exactly -80°," and also disputes the assertion that the holding time at indicated temperatures has no effect on the amount of transformed austenite.

The author says that since temperatures between -110° and -183° were not investigated because investigation in that range at present is very difficult, requiring construction of special equipment, he refrains from the conclusion that -110° is generally an optimum temperature for deep cold treatment of the steels investigated, but arrives at a definite conclusion that, among investigated temperatures for deep cold treatment of steels EI 262 and EI 184 hardened from 1,240° and 1,180° respectively, -110° gives the maximum amount of transformed austenite at a holding time of one hour

7. "Use of Chromel-Alumel Thermocouples in the Presence of Sulfur and Sulfur Gases," B. Ye. Kinkul'kin, pp 97-101

Here the author describes investigations conducted by the Institute of Nonferrous Metallurgy to determine causes of premature failures of Chromel-Alumel Thermocouples at one of the Ural machine-building plants. The author mentions that manufacture of Chromel and Alumel in the USSR was initiated in 1937, and exclusively imported nickel was used for this purpose. He states that consumption of thermal electrodes at the given plant was so high that the year's supply lasted only several months.

He adds that investigation revealed that the failure of thermocouples was caused by action of the sulfur included in the amount of 3.5 - 4.0% into the Ishimbay oil which was used as furnace fuel. It was found by the author

that sulfur and sulfur gases have no effect on iron-base alloys with 25-30% Cr at temperatures up to 1,100° and even higher. Protection tubes made of these alloys eliminate premature failure of thermocuples, considerably prolonging their service life, it is added.

8. "On the Mechanism of Metals Erosion and Protection Effect of Adsorption Coatings," I. G. Polotskiy and T. Ya. Beniyeva, pp 102-109, 15 references.

This paper studies cavitation erosion caused by ultrasonic oscillations. Metals of various chemical activity, various hardness, and various melting points, namely, magnesium, aluminum, nickel, tin, lead, copper, gold, platinum, brass, and stainless steel were used by the authors for studying erosion in the ultrasonic field. It was established that the intensity of erosion depends on the medium.

The authors state that study of the erosion of metals in a number of media, such as nonpolar benzine, toluene, ethyl alcohol, water, and aqueous solutions of sodium oleate, permitted distinguishing the physical and chemical effects of cavitation.

They add that investigation of the protective property of adsorption coatings showed that passivation of metallic surfaces represents a dependable method for preventing cavitation erosion.

9. "On the Phase Diagram of the Nickel-Antimony System," V. N. Yeremenko and G. I. Kruchinina, pp 110-122, 13 references.

This paper presents new experimental data for making more precise the phase diagram of the nickel-antimony system. In the authors's data, the compound Ni_5Sb_2 represents the beta phase and $Ni_{13}Sb_4$ corresponds to the delta phase. It is stated that transition from the beta phase saturated with antimony to the beta phase saturated with nickel causes decrease in the temperature of polymorphous transformation from 547 to 495°.

According to the authors, the phase diagram is construction on the basis of the given investigation and the most reliable data previously published.

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